

Title of Project : Cell competition: a mechanism for survival of the fittest in the multi-cellular community

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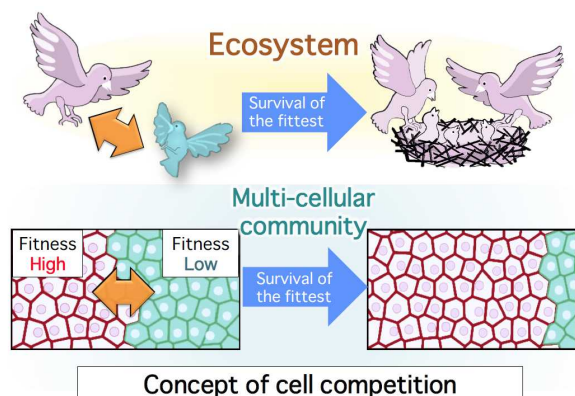
Research Project Number : 26114001 Researcher Number : 50580974

【Purpose of the Research Project】

In an ecosystem, a variety of biological individuals compete with each other for the limited space, food and spouses. Consequently, the fittest will survive, a process known as ‘the survival of the fittest’. Recent studies have revealed that comparable phenomenon also occurs in a multi-cellular community; the identical type of cells with different properties competes with each other for survival, a phenomenon named as ‘**cell competition**’. It has become clear that cell competition is involved in various processes such as embryonic development, selection of the fittest stem cells, and elimination of precancerous cells. However, the molecular mechanisms underlying these processes still remain largely unknown. Furthermore, it is highly plausible that cell competition is involved in a number of yet unidentified physiological and pathological processes.

Here, we will be establishing a comprehensive and integrated research body focusing on cell competition. The main objectives are as follows:

- 1) To understand the full picture of the molecular mechanisms governing cell competition.
- 2) To elucidate how cell competition is involved in the establishment and maintenance of multicellular communities.
- 3) To reveal whether and how the derailment of cell competition leads to pathological conditions or diseases.



【Content of the Research Project】

To reach at the goals described above, we will investigate the following research topics.

- 1) Elucidation of the molecular mechanisms regulating cell competition
- 2) Establishment and analyses of *in vivo* model systems for cell competition
- 3) Mathematical analysis on cell competition

We will share the outputs obtained from all research teams and will comprehensively and cooperatively develop collaborations within the whole group. Furthermore, to intensify and potentiate the productivity, we will additionally recruit research groups studying cell competition from a variety of angles: e.g. clinical medicine, innovative imaging techniques, mathematics, biophysics. Hence, we aim to uncover the full picture of cell competition.

【Expected Research Achievements and Scientific Significance】

The molecules specifically functioning or accumulating during cell competition can be used as biomarkers to capture the occurrence of cell competition, leading to identification of physiological or pathological processes that involve this phenomenon. Hence, the development of this research area would substantially influence various research fields including cell biology, developmental biology, physiology, oncology and clinical medicine.

【Key Words】

Cell competition: competition between the identical type of cells with different properties (e.g. cell proliferation, cell polarity, oncogenic mutations)

【Term of Project】 FY2014-2018

【Budget Allocation】 1,215,400 Thousand Yen

【Homepage Address and Other Contact Information】

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